ascending ramus of the mandible differs according to the food. Elevated in the Leporidæ, it is short in the Sciuridæ, and still shorter in the Muridæ. In the first, the coronoid projects but slightly, is near the condyle and far distant from the molar series, while the angle is broad and well rounded.

In the other two families, the coronoid is feeble, pointed and placed at equal distances between the condyle and the last molar; thus the masseter does not possess a leverage as advantageous as in the Leporidæ. This muscle, however, in the rats has its maxillary attachments much developed, while few fibres spring from the arch.

It has been implied that modifications of the arch are due to variation as brought about by the effects of increased Use and Disuse, aided by the influences commonly attributed to Natural Selection. To what extent these laws have been carried since the earliest records of mammalian life, it would be useless to inquire, as palæontology affords us little or no evidence. They certainly cannot have escaped those which govern Heredity. In the Carnivora, for example, the arch remains essentially the same as it did in the days of the Creodonta, the ancestors of the cats; and similar conditions undoubtedly apply to other groups, so far as our scanty knowledge extends. We must await farther developments for the solution of this as well as of other even more important problems.

A Matter of Priority.

By Patterson DuBois.

(*Read before the American Philosophical Society, April 5, 1895.*)

It is reported that at a meeting of the Royal Society held June 13, 1894, Mr. J. W. Swan presented a number of specimens of leaves of gold of extreme thinness which had been prepared by the process of electro-deposition. Mr. Swan's idea appears to have been to produce gold leaf by electro-chemical instead of mechanical means. The process is briefly described as follows:

"The leaves were prepared by depositing a thin film of gold on a highly polished and extremely thin electro-copper deposit. The copper was then dissolved by perchloride of iron, leaving the gold in a very attenuated condition. The leaves were approximately four-millionths of an inch thick, and some of them mounted on glass showed the transparency of gold very perfectly when a lighted lamp was looked at through them."

Within a few weeks past I, myself, observed an item going the rounds of the public press in reference to this so-called Swan process. We have

no right to say that the process described by Mr. Swan is not entirely original with him. It is proper, however, to call the attention of the American Philosophical Society to the following facts.

At a meeting of this Society held February 16, 1877, William E. DuBois, then Assayer of the United States Mint in this city, and a member of this Society, made a brief communication (*Proceedings*, Vol. xcix) on the production of gold films by a process such as Mr. Swan has within a few months past, through the Royal Society, brought before the public. The inventor of the process was Mr. Alexander E. Outerbridge, Jr., then an assistant in the Assay department of the Mint at Philadelphia and subsequently engaged in establishing and carrying on scientific laboratories at the Whitney Car Wheel Works and at the large establishment of William Sellers & Company, both in this city.

Apart from any future possibility of producing gold leaf by electro-chemical instead of mechanical process, Mr. Outerbridge regarded his results as interesting in a purely scientific aspect. The gold films produced at that time by him seem to have been much thinner than those which were recently shown at the Royal Society by Mr. Swan. Specimens were exhibited in the Philadelphia Mint as early as 1877, and some were obtained by several colleges and individuals. One now in the possession of Dr. George F. Barker, of this city, is accompanied by the written account which Prof. Barker received with it in 1878. This memorandum is as follows :

"Gold film obtained from a copper plate having 20 square inches surface :

"Weight before plating..... $84\frac{470}{1000}$ grs.

"Weight after plating..... $84\frac{505}{1000}$ grs.

"Weight of gold..... .... $\frac{35}{1000}$ gr.

"Calculated thickness, $\frac{1}{2,798,000}$ of an inch ; $59\frac{1}{2}$ times less than a single wave-length of green light."

This is mounted as a slide for a microscope, and has a double fold. I have also specimens in my own possession.

In addition to the brief communication made by Mr. W. E. DuBois to this Society in 1877, as aforesaid, the *Journal of the Franklin Institute* (Vol. ciii, 284) gave an abstract of a lecture delivered by Mr. Outerbridge before the Franklin Institute in 1877. At the stated meeting of the Institute held May 16, 1877, Mr. J. B. Knight, then Secretary, referred in his monthly report to Mr. Outerbridge's process in the following terms :

"*Transparent Gold.*—In the course of a lecture on gold, delivered before the Franklin Institute, on February 27th last, Mr. A. E. Outerbridge, Jr., of the Assay department of the Mint in this city, gave an account of some experiments he had made with the view of ascertaining how thin a film of gold was necessary to produce a fine gold color.

"The plan adopted was as follows : From a sheet of copper rolled down to a thickness of $\frac{5}{1000}$ of an inch he cut a strip $2\frac{1}{2}$ by 4 inches. This strip, containing 20 square inches of surface, after being carefully cleaned

and burnished, was weighed on a delicate assay balance. Sufficient gold to produce a fine gold color was then deposited on it by means of the battery; the strip was then dried without rubbing, and reweighed, and found to have gained $\frac{1}{10}$ of a grain, thus showing that one grain of gold can by this method be made to cover 200 square inches, as compared to 75 square inches by beating.

"By calculation, based on the weight of a cubic inch of pure gold, the thickness of the deposited film was ascertained to be $\frac{1}{980,000}$ of an inch, as against $\frac{1}{367,650}$ for the beaten film.

"An examination under the microscope showed the film to be continuous and not deposited in spots, the whole surface presenting the appearance of pure gold.

"Not being satisfied, however, with this proof, and desiring to examine the film by transmitted light, Mr. Outerbridge has since tried several methods for separating the film from the copper, and the following one has proved entirely successful.

"The gold plating was removed from one side of the copper strip, and by immersing small pieces in weak nitric acid for several days the copper was entirely dissolved, leaving the films of gold, intact, floating on the surface of the liquid. These were collected on strips of glass, to which they adhered on drying, and the image of one of them is here projected on the screen by means of the gas microscope.

"You will observe that it is entirely continuous, of the characteristic bright green color, and very transparent, as is shown by placing this slide of diatoms behind the film. By changing the position of the instrument, and throwing the image of the film on the screen by means of reflected light, as is here done, you will see its true gold color.

"Mr. Outerbridge has continued his experiments, and, by the same processes, has succeeded in producing continuous films, which he determined to be only the $\frac{1}{2,798,000}$ of an inch in thickness, or 10,584 times thinner than an ordinary sheet of printing paper, or sixty times less than a single undulation of green light. The weight of gold covering twenty square inches is, in this case, $\frac{35}{1000}$ of a grain; one grain being sufficient to cover nearly four square feet of copper."

In a lecture on "Matter," delivered at the International Electrical Exhibition (Philadelphia), October 9, 1884, and subsequently printed in the *Journal of the Franklin Institute*, September, 1885, Mr. Outerbridge himself made the following statement:

"After a series of careful experiments, I have obtained, in this way, sheets of gold, mounted on glass plates, which are not more than $\frac{1}{40,000}$ of a millimetre thick; and I have some specimens to show you which I have good reason to believe are not more than $\frac{1}{400,000}$ of a millimetre. To give you an idea of this thickness, or, rather, thinness, I may say that it is about $\frac{1}{200}$ part of a single wave-length of light. Such figures are not haphazard guesses, but are based upon reliable and understandable data, and are easily susceptible of verification.

"We cannot claim for the thinnest of these films that they represent a single layer of molecules. Taking Sir William Thomson's estimate of the size of the final molecules, and considering that each layer corresponds to one page of a book, our thinnest film would then make a pamphlet having more than a hundred pages. It is found that when such a film is interposed between the eye and any object it is as transparent as a piece of glass. This may be readily proved by projecting a picture on the screen and interposing the leaf of gold in the path of the light and you see that the only apparent effect is to tinge the light a pale greenish color, none of the detail of the picture is lost, though all the light is coming through a piece of gold as absolutely continuous in its structure, when examined under a microscope, as though it were an inch thick. By placing in the lantern a piece of ordinary gold leaf, having a thickness of about $\frac{1}{200,000}$ of an inch, and a piece of electro-plated gold leaf about $\frac{1}{3,000,000}$ of an inch thick, mounted side by side on a glass slide and focusing their images on the screen, you will see a very great difference in the amount of light transmitted by the two, owing to the difference of thickness."

One particularly interesting thing about the foregoing extract is that the lecture from which it was taken was bound in as a part of the literature relating to the exhibition, and sent broadcast to exhibitors and others, to whom Mr. Swan's revelations ought therefore to come with no degree of novelty.

The *Journal of the Franklin Institute*, in its issue of September, 1894 (Vol. cxxxviii, 825), refers to the Outerbridge and Swan processes in an article which concludes as follows:

"It may be stated, in conclusion, that the mode of procedure above described was patented by its author [Alexander E. Outerbridge, Jr.], under the title 'Manufacture of Metallic Leaf.' In his patent the inventor describes, as 'a new and improved method of manufacturing gold leaf, silver leaf, and other metallic leaf,' the above-named method of electrical deposition. As suitable mediums to support his films, he mentions copper in thin sheets, and paper, shellac, wax, etc., made conductive upon the surface which is to receive the deposit.

"For removing the deposited film from copper and paper, Mr. Outerbridge describes the use of a bath of dilute nitric acid, or of perchloride of iron. In the case of the shellac, wax, etc., alcohol, benzine and other solvents are referred to."

The patent granted to Mr. Outerbridge is No. 198,209, and is dated December 18, 1877.

The American Philosophical Society is presumably interested in questions of scientific priority, especially when that priority is American, and still further, when it is Philadelphian. As Mr. Outerbridge and I worked side by side for twelve years as assistants in the Assay department of the Mint in this city, I am glad to add my testimony towards the substantiation, if such were necessary, of the facts herein mentioned. As stated

in the beginning, Mr. Swan's process, notwithstanding its striking similarity to Mr. Outerbridge's, may be fairly original with Mr. Swan, but it was also original with Mr. Outerbridge some seventeen years before Mr. Swan appears to have made his achievement known.

The Protohistoric Ethnography of Western Asia.

By Daniel G. Brinton, M.D.

(*Read before the American Philosophical Society, April 19, 1895.*)

Many of the most weighty problems in ethnography and in the history of civilization depend for their solution on the relative positions of races and linguistic stocks in western Asia at the dawn of history. The numerous special studies which have been devoted to the archæology of this region are abundantly justified by the importance of the results obtained and yet to be expected.

It is my intention in this article to examine these studies with the aim of ascertaining what races and stocks occupied the area in question in protohistoric times, and where lay the lines of demarcation between them. It is possible that by bringing to bear upon the questions involved the general principles of ethnographic research, some light may be thrown on points still obscure. This I shall have in view when it appears applicable.

The area to be considered is roughly that portion of Asia between the thirtieth and fortieth parallels of north latitude, and west of the fiftieth meridian east of Greenwich. It includes the whole of the Euphrates-Tigris valley, Syria, Asia Minor and Trans-Caucasia.

Alleged Prehistoric Races.

The assertion has been often made that there are indications of races in this area belonging to other varieties of the human family than those discovered there in the protohistoric period.

These statements require to be examined as a preliminary to the study of the earliest historic peoples.